



Reg. No. :

Name :

**First Semester M.Tech. Degree Examination, February 2015
(2013 Scheme)**

**Branch : Electronics and Communication Engineering
Streams : Microwave and TV Engineering, Signal Processing,
Communication Systems, Telecommunication Engineering
TMC 1002 : ADVANCED DIGITAL COMMUNICATION**

Time : 3 Hours

Max. Marks : 60

Instructions : 1) Answer **any two** questions from **each** Module.

2) **Each** question carry **equal** marks.

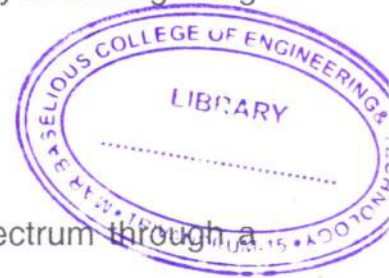
(10×6 = 60 Marks)

Module – I

1. Derive the equations for the Gram-Schmidt procedure that will result in a set of $N \leq M$ orthonormal signal waveforms using a set of M signal waveforms $\{S_m(t)\}$ that are complex valued.
2. Obtain the structure of Non-coherent receiver for BFSK signal through random phase channel.
3. Prove that optimum receiver for coloured noise channel using Karhunen loeve expansion approach is same as that of the receiver obtained by whitening using MAP rule.

Module – II

4. The transmission of a signal pulse with a raised cosine spectrum through a channel results in the following sampled output from the demodulator.





$$\chi_k = \begin{cases} -0.5 & (k = -2) \\ 0.1 & (k = -1) \\ 1 & (k = 0) \\ -0.2 & (k = 1) \\ 0.05 & (k = 2) \\ 0 & \text{otherwise} \end{cases}$$

Determine the tap coefficients of a three tap linear equalizer based on ZF criterion. Also determine the equalized output and the residual ISI.

5. Discuss Nyquist criterion for zero ISI. How controlled ISI can be realized ? Give decoding rule for partial response signalling.
6. A CDMA system consists of 15 equal power users that transmit information at a rate of 10,000 bits/sec., each using a DS_SS signal operating at a chip rate of 1 MHz. The modulation is BPSK. Determine the E_b/J_0 , where J_0 is the spectral density of the combined interference. What is the processing gain ? How much should the processing gain be increased to allow for doubling the number of users without affecting the output SNR ?

Module – III

7. Derive impulse response of multipath fading channel. Discuss channel correlation functions and power spectra. Give scattering function of multipath channel.
 8. Consider a pure ALOHA system operating with a throughput of 6.1 and packets generated with Poisson distribution with rate λ . Determine :
 - i) the value of G, the normalized channel traffic.
 - ii) the average number of attempted transmissions to send a packet.
 9. Compare the performance of FDMA, TDMA and CDMA in terms of the information rate achieved in an ideal AWGN channel.
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